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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/056,179	01/22/2002	Theodore M. Taylor	MI22-1824	9467
21567	7590	11/19/2003	EXAMINER	
WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			WEISS, HOWARD	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 11/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/056,179	TAYLOR, THEODORE M.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Howard Weiss	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 July 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 70-84 ~~is/are~~ are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 70-84 ~~is/are~~ are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All   b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                          | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>0603</u> | 6) <input type="checkbox"/> Other: _____                                    |

Attorney's Docket Number: MI22-1824  
Filing Date: 1/22/02  
Continuing Data: RCE established 3/11/03  
Claimed Foreign Priority Date: none  
Applicant(s): Taylor

Examiner: Howard Weiss

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:
  - (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
2. Claims 70 to 72, 75, 77 to 82 and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mori et al. (U.S. Patent Application No. 2002/0093073), Hokazono (U.S. Patent No. 6,573,583) and Sakakibara et al. (U.S. Patent Application No. 2002/0000603).

Mori et al. show most aspects of the instant invention (e.g. Figure 11C) including:

- a semiconductive substrate **1**
- a pair of STI masses **125, 126** with first portions within the substrate and second portions projecting outwardly from the substrate
- said first portions having opposing sides orientated normal to the surface of said substrate and defining an active area
- said second portions having opposing said orientated perpendicular to said surface, displaced laterally relative to the opposing sides of said first portions so as to define an opposing step surface said step aligned with said sides of said first portion and having the other features as claimed
- a first dielectric layer **32** made of silicon oxide and received over the active area

- a floating gate **42,58** with a concave upper surface and which does not fill the region between the second portion's opposing sides
- a second dielectric layer **6** made of either silicon oxide or ONO and a control gate **7**

Mori et al. does not show the opposing step surface elevationally aligned the active area upper planar surface, the first dielectric layer received over the step surface with an upper surface parallel to the active area upper planar surface and explicitly made of ONO.

Hokazono teaches (e.g. Figure 4) to align an opposing step surface of an STI **16** second portion **18** with the active area upper planar surface **7** (Figure 3) to avoid defective device isolation characteristics (Column 10 Lines 43 to 50). It would have been obvious to a person of ordinary skill in the art at the time of invention to align an opposing step surface of an STI second portion with the active area upper planar surface as taught by Hokazono in the device of Mori et al. to avoid defective device isolation characteristics and improve the device (Column 3 Lines 56 to 62).

Sakakibara et al. teach (e.g. Figure 2a) to extend a first dielectric **41** over a STI mass **30** to restrict production of seams (Page 4 Paragraph 0045). It would have been obvious to a person of ordinary skill in the art at the time of invention to extend a first dielectric **41** over a STI mass as taught by Sakakibara et al. in the device of Mori et al. to restrict production of seams. In reference to the orientation of the upper surface of the first dielectric, said upper surface would be parallel over the step surface when extended over the STI of Mori et al. and Hokazono.

In reference to the first dielectric being made of silicon oxide instead of ONO, Mori et al. teach (e.g. Page 9 Paragraph 0118) that ONO is an equivalent material known in the art. Therefore, it would have been obvious for one of ordinary skill in the art to substitute ONO for silicon dioxide for the first dielectric layer material.

3. Claims 73 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mori et al., Hokazono and Sakakibara et al., as applied to Claim 70 above, and in further view of Ding et al. (U.S. Patent No. 6,214,667).

Mori et al., Hokazono and Sakakibara et al. show most aspects of the instant invention (Paragraph 3) except for a floating gate **222a** with a concave upper surface and which fills the region between the second portions of the STI masses. Ding et al. teach (e.g. Figure 2F) to have a floating gate **222a** with a concave upper surface and which fills the region between the second portions of STI masses **216a** to minimize cell size and increase device integration (Column 1 Lines 54 to 57). It would have been obvious to a person of ordinary skill in the art at the time of invention to have a floating gate with a concave upper surface and which fills the region between the second portions of STI masses as taught by Ding et al. in the device of Mori et al., Hokazono and Sakakibara et al. to minimize cell size and increase device integration.

4. Claims 74 and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mori et al., Hokazono and Sakakibara et al., as applied to Claim 70 above, and in further view of Shirai et al. (IEDM 1995).

Mori et al., Hokazono and Sakakibara et al. show most aspects of the instant invention (Paragraph 3) except for the rugged outermost surface of said floating gate being made of hemispherical grain polysilicon (HSG Poly-Si). Shirai et al. teach (e.g. see Abstract) to roughen up the outer surface of a floating gate using HSG Poly-Si to increase the capacitive-coupling ration of the memory cell. It would have been obvious to a person of ordinary skill in the art at the time of invention to roughen up the outer surface of a floating gate using HSG Poly-Si as taught by Shirai et al. in the device of Mori et al., Hokazono and Sakakibara et al. to increase the capacitive-coupling ration of the memory cell.

***Response to Arguments***

5. Applicant's arguments with respect to Claims 70 to 84 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

7. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications. The official TC2800 Before-Final, **(703) 872-9318**, and After-Final, **(703) 872-9319**, Fax numbers will provide the fax sender with an auto-reply fax verifying receipt of their fax by the USPTO.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(703) 308-4840** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via **Howard.Weiss@uspto.gov**.


Any inquiry of a general nature or relating to the status of this application should be directed to the Group 2800 Receptionist at **(703) 308-0956**.

9. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/317, 510	thru 11/7/03
Other Documentation: none	
Electronic Database(s): EAST	thru 11/7/03

HW/hw  
7 November 2003

Howard Weiss  
Examiner  
Art Unit 2814

  
SU. [illegible] 11/11/03